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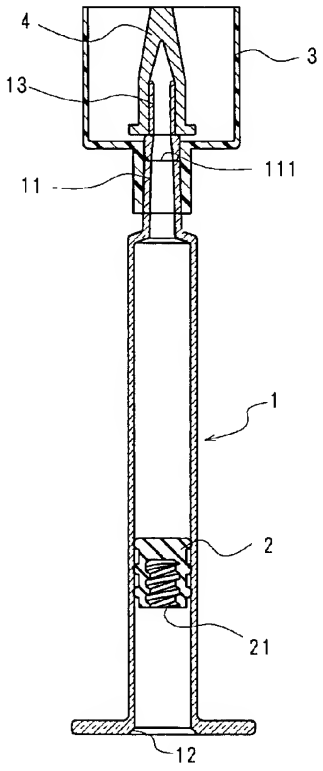
## (54) Syringe-type container for liquid medicine

(57) A syringe-type container for liquid medicine comprises a barrel (1) provided with an easily breakable piercing needle (13) at a distal end (111) of a needle-connecting portion (11) thereof; a gasket (2) inserted and held in the barrel (1); and a guide means (3) fitted on the barrel (1) from the distal side thereof. The syringe-type container is so constructed that turning of the guide means (3) relative to the barrel (1) breaks off the piercing needle (13) from the needle-connecting portion (11).

FIG. 1




EP 1 323 446 A2

## Description

**[0001]** The present invention relates to a syringe-type container for liquid medicine suitable for use as a so-called prefilled-syringe, i.e., syringe previously filled with a liquid medicine.

**[0002]** Certain drugs change its nature or deteriorate quality in the form of a liquid medicine, and thus they are stored in a drug container such as vial in the form of a solid medicine, powder medicine or freeze-dried medicine. Such solid medicines are mixed with a solution injected into the vial with a syringe just before use to reconstitute a liquid medicine in the vial, and the resultant liquid medicine is then withdrawn into the syringe to inject it into a patient. For example, a solid medicine prefilled in a vial is reconstructed by the procedures comprising the steps of withdrawing a solution from an ample or a vial into a syringe (or fitting a needle for dissolution on a prefilled-syringe containing a solution prefilled therein), piercing the needle into a rubber stopper of the vial, injecting the solution in the syringe into the vial to reconstitute a liquid medicine from the solid medicine and solution, and then withdrawing the resultant liquid medicine from the vial into the same syringe.

**[0003]** However, in the conventional method using a syringe, it is required to use a metal needle for reconstruction of a liquid medicine. Thus, there is a fear of injuring a user with the needle. Also, there is the possibility of coring when the needle is pierced into the rubber stopper at an angle with respect to the top plane of the stopper.

**[0004]** Thus, the present invention has been made in view of the above circumstances and is intended to provide a syringe-type container for liquid medicine, which makes it possible to prepare a liquid medicine without causing any injury of the user and coring of a rubber stopper.

**[0005]** The above object of the present invention is achieved by breakably fitting an distal end of a syringe with a piercing needle for dissolution, and providing a means for breaking the piercing needle and guide means for guiding a vial.

**[0006]** According to the present invention, there is provided a syringe-type container for liquid medicine, comprising:

a barrel having a needle-connecting portion and an easily breakable hollow piercing needle coaxially joined to a distal end of the needle-connecting portion;

a gasket liquid-tightly and slidably inserted into the barrel through a proximal end thereof; and

a hollow guide means fitted from the distal side of said barrel on the needle-connecting portion thereof to guide a mouth of a vial toward the needle-connecting portion;

wherein said piercing needle is adapted to be broken off from the needle-connecting portion when said guide means is relatively turned with respect to said barrel.

**[0007]** The guide means may be a member comprising a fitting portion for connection to the needle-connecting portion, and a guide portion into which the mouth of the vial is slidably inserted. In this case, the piercing needle is provided at a portion adjacent to the needle-connecting portion with an engaging portion for engagement with the fitting portion of the guide means, and the fitting portion is provided with an engaging means for engagement with the engaging portion. The engaging portion is so designed as to have a shape associate with that of the engaging means. For example, when the engaging portion is made into a shape with a regular polygonal cross section, the engaging means, i.e., a lumen of the fitting portion at a portion corresponding to the engaging portion, is made into a shape complementary to that of the engaging portion. Alternately, when the engaging portion is provided with at least one longitudinal rib, the fitting portion may be provided with at least one longitudinal groove which engages with the at least one longitudinal rib, or at least one longitudinal rib adapted to be engaged with said at least one longitudinal rib of said engaging portion when said guide means is turned around the piercing needle. The syringe-type container for liquid medicine may be a so-called "prefilled syringe", or a syringe previously filled with a liquid medicine.

**[0008]** The above and other objects and features of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings throughout which like parts are designated by like reference numerals.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]**

Fig. 1 is a longitudinal section of a syringe-type container for liquid medicine illustrating one embodiment of the present invention;

Fig. 2 is a longitudinal section of a container body shown in Fig. 1;

Fig. 3 is an enlarged section view of the container body shown in Fig. 1, taken along a line X-X' in Fig. 2;

Fig. 4 is an enlarged section view of a guide means shown in Fig. 1;

Fig. 5 is an enlarged section view taken along a line Y-Y' in Fig. 4;

Fig. 6 is an enlarged section view of the guide means shown in Fig. 1, taken along a line Z-Z' in Fig. 5; and

Figs. 7 and 8 are schematic diagrams illustrating usage of the syringe-type container for liquid medicine according to the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0010]** As illustrated in Fig. 1, a syringe-type container for liquid medicine according to the present invention comprises a barrel 1 having a needle-connecting portion 11 at a distal side thereof and being provided with an easily breakable piercing needle 13 at a distal end 111 of the needle-connecting portion 11 thereof; a gasket 2 inserted and held in the barrel 1; and a guide means 3 fitted on the barrel 1 from the distal side thereof. The syringe-type container is so constructed that turning of the guide means 3 relative to the barrel 1 breaks off the piercing needle 13 from the needle-connecting portion 11.

**[0011]** The barrel 1 is a cylindrical member generally made of polypropylene, polyethylene or the like. As illustrated in Fig. 2, the piercing needle 13 is coaxially and easily breakably joined to the distal end 111 of the needle-connecting portion 11 to which an injection needle (designated by 7 in Fig. 8) is connected at the time of injection.

**[0012]** The piercing needle 13 is a hollow needle having a pointed edge 131 at a distal end thereof, and a lumen 132 passing therethrough and communicated with a lumen 112 of the needle-connecting portion 11. The piercing needle 13 is provided, at a proximal portion thereof, i.e., a portion adjacent to the needle-connecting portion 11, with an engaging portion 133 which is adapted to be engaged with an engaging means 321 provided in the fitting portion 32 of the guide means 3 mentioned below. The engaging portion 133 may be made into a shape with a regular polygonal cross-section or the like as illustrated in Fig. 3, but it may be made into a shape with one or more longitudinal ribs provided on an outer wall thereof (not illustrated in the drawings). The piercing needle 13 may be protected against contamination by a cap 4 fitted thereon, as illustrated in Fig. 1.

**[0013]** The gasket 2, made of an elastic material such as butyl rubber or thermoplastic elastomer, is inserted into the barrel 1 through the proximal open end 12 thereof and liquid-tightly and slidably held in the barrel 1. The gasket 2 is provided at a proximal portion thereof with an engaging means such as an internal thread 21 to associate it with a plunger 4 as illustrated in Fig. 7. The guide means 3 is fitted on the distal side of the needle-connecting portion 11 of the barrel 1 to guide a mouth 61 of a vial (designated by 6 in Fig. 7) along the longitudinal axis of the barrel 1. The guide means 3 is adapted to allow the piercing needle 1 to be broken away from the needle-connecting portion 11 when the guide means 3 is turned relative to the barrel 1.

**[0014]** The guide means 3 is made of a synthetic resin such as polypropylene, ABS resin or polyethylene and comprises a guide portion 31 adapted to slidably and removably hold the mouth 61 of the vial 6 inserted therein, and a fitting portion 32 to be fitted on the needle-connecting portion 11, as illustrated in Figs. 4 to 6. The guide portion 31 is made into a bottom-closed cylindrical shape with an inner diameter approximately equal to an outer diameter of the mouth 61 of the vial 6 so that the vial 6 inserted into the guide means 3 is slidable along the side wall 311 of the guide means 3 in the direction approximately perpendicular to a bottom face 312 of the guide means 3. The fitting portion 32 is so designed as to have a shape of which at least proximal side is complementary to the shape of the needle-connecting portion 11 to be fitted therein. In other words, the fitting portion 32 is made into a tubular shape with an inner diameter gently tapered toward the distal end thereof. At the distal side of the fitting portion 3, i.e., at a portion adjacent to the guide portion 31, there is provided the engaging means 321 to be engaged with the engaging portion 133 of the piercing needle 13. The engaging means 321 is made into a shape complementary to the engaging portion 133. For example, if the engaging portion 133 is made into a shape with a regular polygonal cross section, the engaging means 321 may be formed as a lumen 321 with a cross section complementary to the engaging portion 133. If the engaging portion 133 is provided on the outer wall thereof with one or more longitudinal ribs (not illustrated in the drawings), the engaging means 321 may be one or more longitudinal grooves adapted to be engaged with the longitudinal ribs, or one or more longitudinal ribs adapted to be engaged with the longitudinal ribs of the engaging portion 133 when the guide means 3 is turned around the axis of the piercing needle 13. In that case, the engaging portion 133 is generally provided with one longitudinal rib, but it may be provided with two or more longitudinal ribs. Although one longitudinal rib used as the engaging means is the sufficient condition, it is preferred to provide plural ribs (preferably, three to five ribs) at even intervals since the provision of the plural ribs makes it possible to reduce a rotation angle of the guide means 3.

**[0015]** The syringe-type container for liquid medicine according to the present invention may be used as a so-called "prefilled syringe", i.e., a syringe containing a liquid medicine previously charged therein. In that case, the piercing needle 13 on the distal side of the syringe should be closely sealed with a cap 4 of butyl rubber or thermoplastic elastomer in the nature of things.

**[0016]** The prefilled syringe of the present invention may be used according to the following procedure, which will be explained below with reference to Figs. 7 and 8. Firstly, after preparing a prefilled syringe P and a vial 6, a plunger 5 is connected to the gasket 2 of the prefilled syringe P, as illustrated in Fig. 7a. After removing the cover 4 from the piercing needle 13, the prefilled-syringe P is moved in the direction of an arrow A and then the rubber stopper 62 of the vial 6 is pierced with the piercing needle 13 as illustrated in Fig. 7b by sliding the mouth 61 of the vial 6 along the guide portion 31 of the guide means 3. The solution S in the barrel 1 of the prefilled-syringe P is injected into the vial 6 by pushing the plunger 5, and then the vial 6 is fully shaken for mix-

ing the solution S with the drug D. The vial 6 and the prefilled syringe P are turned upside down as illustrated in Fig. 7c. By moving the plunger 5 in the direction of an arrow C, the resultant liquid medicine LM in the vial 6 is drawn into the barrel 1 of the prefilled syringe. By turning the vial 6 in the direction of an arrow E as illustrated in Fig. 8d, the piercing needle 13 is broken off and removed together with the guide means 3 and the vial 6 from the prefilled syringe P as illustrated in Fig. 8e. After fitting a needle 7 on the needle-connecting portion 11 of the prefilled syringe P as illustrated in Fig. 8f, by pressing the plunger toward the needle-end, the liquid medicine may be injected into a cavity of the body such as vein of a patient.

**[0017]** As will be understood from the above, the present invention makes it possible to prepare a liquid medicine without causing any injury of the user and coring of a rubber stopper. Further, there is no need to separate any metal needle from the plastic members since the syringe-type container of the present invention has no metal needle.

**[0018]** Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

## Claims

1. A syringe-type container for liquid medicine, comprising a barrel having a needle-connecting portion and an easily breakable hollow piercing needle coaxially joined to a distal end of the needle-connecting portion; a gasket liquid-tightly and slidably inserted into the barrel through a proximal end thereof; and a hollow guide means fitted from the distal side of said barrel on the needle-connecting portion thereof to guide a mouth of a vial toward the needle-connecting portion; wherein said piercing needle is adapted to be broken off from the needle-connecting portion when said guide means is relatively turned with respect to said barrel.

2. The syringe-type container for liquid medicine according to claim 1, wherein said guide means comprises a fitting portion for connection to the needle-connecting portion, and a guide portion into which the mouth of the vial is slidably fitted, wherein said piercing needle is provided at a portion adjacent to the needle-connecting portion with an engaging portion for engagement with said fitting portion of the guide means, and wherein said fitting portion is provided with an engaging means for engagement with the engaging portion.

3. The syringe-type container for liquid medicine according to claim 2, wherein said engaging portion is made into a shape with a regular polygonal cross section, and the fitting portion corresponding to said engaging portion has a lumen complementary to the shape of said engaging portion.

4. The syringe-type container for liquid medicine according to claim 3, wherein said engaging portion is provided with at least one longitudinal rib, and wherein said fitting portion is provided with at least one longitudinal groove adapted to be engaged with said at least one longitudinal rib.

5. The syringe-type container for liquid medicine according to claim 2, wherein said engaging portion is provided with at least one longitudinal rib, and wherein said fitting portion is provided with at least one longitudinal rib adapted to be engaged with said at least one longitudinal rib of said engaging portion when said guide means is turned around the piercing needle.

6. The syringe-type container for liquid medicine according to claim 1, wherein said container is filled with a liquid medicine.

FIG. 1

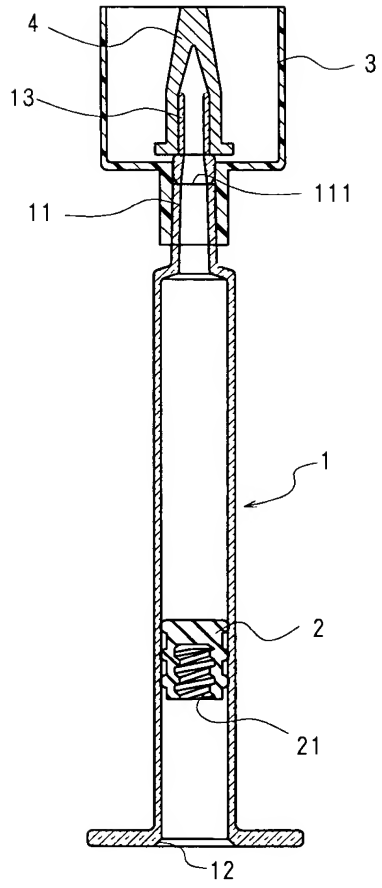


FIG. 2

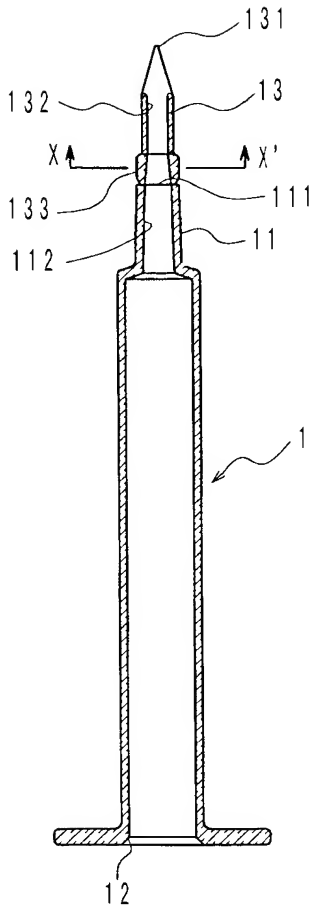


FIG. 3

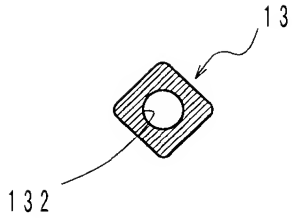



FIG. 4

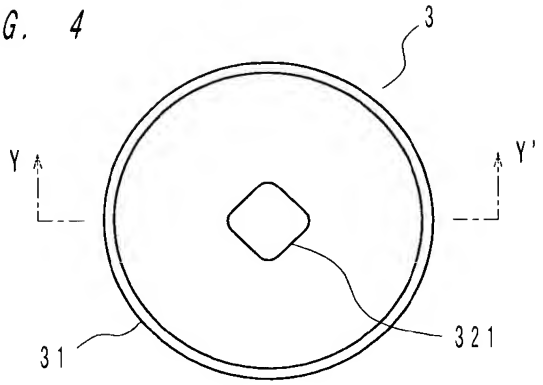


FIG. 5

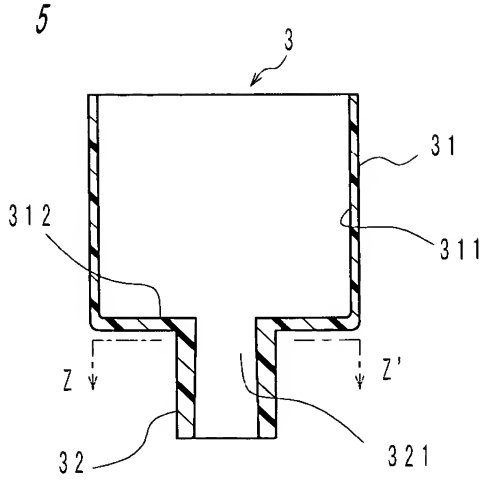



FIG. 6

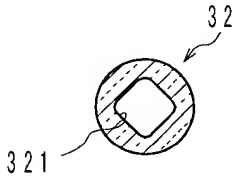


FIG. 7

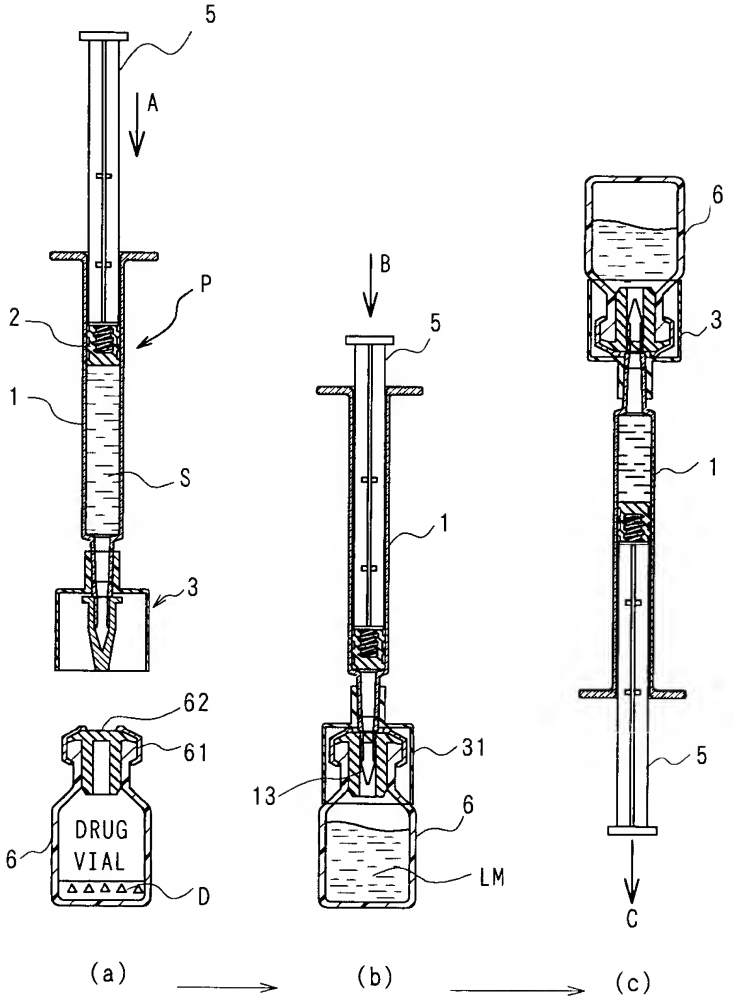


FIG. 8